

## White Paper on Lean Manufacturing

Lean Manufacturing is often referred to as the Toyota Production System, since Toyota introduced the concept and others have adapted it to other manufacturing settings, enterprises, healthcare, and government services. To explain the concept I need to begin with 2 definitions:

- **Value** - A capability provided to a customer at the right time at an appropriate price, as defined in each case by the customer. Features of the product or service, availability, cost and performance are dimensions of value.
- **Waste** - Any activity that consumes resources but creates no value (waste).

Lean focuses on eliminating waste in processes so that a higher percentage of value is produced from production effort. Generally, time in manufacturing efforts is considered to be 90% waste and 10% value. The lean focus is on learning what is important to the customer and expanding capacity with cost reduction and shortening cycle times between order and ship date, rather than on eliminating people from the production effort. Companies that are lean want their people focused on valuable tasks, so they attract more customers. Lean principles are:

- Specify value (can only be defined by the ultimate customer)
- Identify the value stream (exposes the enormous amounts of waste)
- Create flow (reduce batch size and Work In Progress)
- Let the customer pull product through the value stream (make only what the customer has ordered)
- Seek perfection (continuously improve quality and eliminate waste)

Toyota recently stated that it is roughly 50% waste-free, so it clearly sees itself on the journey to perfection with a long way to go. Lean Manufacturing has a number of tools and techniques that are often considered to be lean manufacturing themselves. I prefer to consider Lean Manufacturing the framework (toolbox) used by companies on the continuous improvement journey if they are manufacturers. Here are some of the tools that StatOrg Services, LLC knows and can help you implement when you are ready to improve your operations:

- ✚ **5S and Visual Control** – 5S stands for sort, straighten, shine, standardize, and sustain the factory floor so that waste materials and equipment are removed from production spaces. This process involves a facilitator working with a production team to help them sort waste from valuable materials and equipment. Many companies do this now and then but lean companies do it regularly and keep score to track their progress toward improvement. Visual control involves using the tried and true theory that pictures are worth a thousand words. Factory floors are more understandable if areas are color coded, aisles are marked, arrows indicate material flow, and there are maps to help all workers find locations.
- ✚ **Kaizen** – Kaizen is Japanese for “change for the good” and is the word used to describe a continuous improvement process used by lean manufacturers. A trained facilitator leads a work-group to develop a solution to a problem that has been spotted by company leaders. The intent is to quickly review the problem, brainstorm possible improvements, select the most likely improvement, and

develop an implementation strategy that can be put in place to achieve quick results. Kaizen events typically involve a week with workers removed from their assignments to provide their expertise on the current state of the job, what alternatives might be possible, and which of those are the best alternatives. The facilitator is thoroughly familiar with tools to help the work-group determine the root cause of problems, assessment tools to assist in determining which alternatives will yield the most improvements, and other tools to assist the work-group with process mapping, load levelling, resource allocation, inventory adjustments, and supply chain improvements. Kaizen events are short models of the Deming Cycle (Plan, Do, Check, Act) that are used to make improvements continuously on the theory that any change will improve performance if studied and developed by those in the work-group.

- ✚ **Value Stream Analysis** – Value Stream analysis is often done using a Kaizen approach. The effort starts with determining what the customer wants (value), and designing the manufacturing process so that value flows (streams) with minimal interruptions. The current state study involves documenting all the barriers to flow, and the design of the future state is devoted to reducing those barriers as much as possible to eliminate waste and increase the flow of value.
- ✚ **Pull Manufacturing** – Pull manufacturing is a combination of Just in Time inventory and Kanban inventory techniques, and other similar techniques. Lean manufacturing is really about reducing the need for overhead, and delivering what is needed when it is needed. High inventory is waste, and traditional push manufacturing systems can become filled with inventory. American automotive manufacturers still push their production to dealerships and fall inventories are illustrative of what lean manufacturers work to avoid. Just in time inventory means that efforts are devoted to meeting demand just as it is needed. Kanban (Japanese for “card”) is the measure used to determine the level needed to be on hand. Kanban is calculated as the stock necessary to cover in-transit time and a small margin to avoid production down-time.
- ✚ **Mistake Proofing** – Mistake proofing is thinking about the design of products and production and designing in ways to prevent mistakes. Poka Yoke is the Japanese term for mistake proofing and most often refers to a team working with a facilitator to prevent mistakes in the design of products so that customers will receive higher quality. Examples are abundant in you car with ignition keys that can be inserted any way to work, turn signals that turn off after you complete a turn, and lights that turn off when the ignition is turned off. Another form of mistake proofing is the Production Preparation Process, which often is done as a Kaizen event to assist a work-group in designing the production area for improvements. The focus is on designing the production area to maximize flow and reduce waste so that product flows quickly through a work-group.
- ✚ **Quick Changeover** - Changeover is the process of converting a line from one type of product to another, and quick changeover is designing production to minimize that time to increase production flexibility. Japan’s Shigeo Shingo developed a process called Single Minute Exchange of Dies (SMED) that taught manufacturing there was no longer a need for a month shut down to change dies and get setup for a new production year. The key is the study and separate internal and external activities in changeover so that production can continue while changeover occurs.

A continuous improvement process can add value, but only if it understands that time and quality are intimately linked. Lean and Six Sigma are completely linked as partners in cost reduction, lead time, and quality improvement. A firm that does one will be driven to the other – some problems need the depth of Six Sigma and other problems need the speed of Lean, and the Lean Six Sigma methods gives manufacturers both to develop a sustaining competitive advantage. StatOrg Services, LLC knows the strengths of both Lean and Six Sigma disciplines, and can help you assess where the speed of Lean will pay off and where the depth of Six Sigma is the best approach for you to see improvement. We have experienced the pain of using Lean tools to solve Six Sigma problems, and learned from those efforts.

Give us a call if you need to get your manufacturing enterprise on the road to continuous improvement.

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